4. It is assumed that the suprarenal extract increases the tonicity of the protoplasm surrounding the pores of the endothelia of the capillaries, thereby reducing the facility for the interchange between the blood and the tissue fluid.

A STUDY OF BRAIN TUMORS.

WITH REPORTS OF FOUR CASES.

By Newton Evans, M.D.,
of Battle Creek, Michigan,
and
Benton Colver, M. D.,
of Dayton, Ohio.

Under brain tumors are included any new-growth upon or within the substance of the brain, including cysts and aneurysms, but excluding abscess. As many as sixteen or seventeen different pathological varieties of growths have been named. Of these the most important and most frequent are gliomata, sarcomata, including endotheliomata, tubercles (tyromata), and syphilitic gummata. Among some of the less frequent are carcinomata (secondary), psammomata, cysts, and angiomata.

As to the relative frequency of the more important varieties statistics are at variance. Starr's table of 600 cases gives: tubercles, 30 per cent.; glioma (including gliosarcoma), 20 per cent.; sarcoma, 20 per cent.; carcinoma, 8 per cent., and gumma, only 4 per cent. Another list of 100 cases gives: glioma, 20 per cent.; sarcoma, 18 per cent.; tubercles, 13 per cent., and gumma, 13 per cent., while carcinoma has 7 per cent. Of the cases herewith reported three are sarcomata and one a glioma.

There is also a decided lack of agreement as to the frequency of occurrence of brain tumors in general. In all probability intracranial tumors are considerably more frequent among the insane than in the entire population. Clouston stated that 28 per cent. of the insane have brain tumors, while Esquirol gives the frequency as low as 2.7 per cent. Blackburn[1] found in 1814 autopsies upon bodies of the insane dying at the Government Hospital for the Insane at Washington 31 cases with intracranial tumors, or a proportion of 1.7 per cent., or 1 case in 58.

Etiology. In general, the causation is obscure. As to age, the decade from thirty to forty years seems to have the greatest number, with a considerable predominance of cases in the years under thirty

[1] Intercranial Tumors among the Insane, 1903.

over those after forty, showing greater frequency in the young than in the old.

The male sex seems more subject than the female, in the proportion of 5 to 3, or 3 to 2.

A history of trauma preceding the appearance of the tumor is given in a large number of cases, but probably the importance of these injuries is somewhat overestimated. Tubercles and gummata are, of course, the result of specific infections, and carcinomata are invariably metastatic from tumors in other parts of the body.

For convenience in locating new-growths in the brain, it may be divided into a number of areas.

1. Frontal lobes.
2. Motor cortex.
3. Parietal region.
4. Occipital lobes.
5. Temporal lobes.
6. Corpus callosum.
7. Basal ganglia and internal capsule.
8. Corpora quadrigemina and pineal gland.
9. Pituitary body.
10. Crura cerebri.
11. Pons and medulla.
12. Cerebellum.
13. Multiple tumors.

Schuster,[1] in his exhaustive monograph on the *Psychical Symptoms of Brain Tumor*, has made a composite table of some thousands of cases from a number of sources, showing that of all brain tumors 21.6 per cent. occur in the cerebellum; 14.7 per cent. are multiple; 12.1 per cent. in the frontal lobes, and 12 per cent. in the motor region. The region claiming the least number is the corpus callosum, with 2.5 per cent.

SYMPTOMS. The symptoms of brain tumor are classed as general and focal. The general symptoms are due to intracranial pressure produced by the presence of the tumor and the increased amount of cerebrospinal fluid. These may be classed under seven heads.

1. *Headache.* Usually this is the earliest symptom, and is said to occur in over 50 per cent. of all cases. The severity of the pain is characteristic. It is lancinating or boring, and may be periodic, being absent at times. Often its location is indicative of the position of the tumor.

2. *Vertigo.* This is present in about one-half of the cases, and is often so severe that the patient may fall. It is most frequent in tumors of the cerebellum.

3. *Vomiting* occurs without reference to taking of food, without nausea or pain, and is usually of a projectile character. In one of

---

[1] Psychische Sterungen bei Hirntumoren, Stuttgart, 1902.

the cases reported herewith vomiting occurred most frequently in the morning before rising from bed. It is present in more than 50 per cent. of the cases.

4. *Optic neuritis* and blindness is present in from 60 to 80 per cent. of all cases, and may be an early or a late symptom, but it is one of the most important signs. In our four cases it was present in three, and possibly absent in one.

5. *Mental* or *psychic symptoms* are said to be present in nearly all cases, but Gianelli concludes from a list of about 700 cases that definite psychical disturbances are present in about 58 per cent. of cases. In 775 cases collected by Schuster, 352 are described as having definite psychical symptoms, while the remaining 423 cases had simple mental weakness, dementia, or somnolence.

One might also say that the definite psychical disturbances are focal symptoms rather than general, as they greatly predominate in cases with tumors in certain regions, particularly the frontal lobes. While of all tumors of the brain about 22 per cent. occur in the cerebellum and 12 per cent. in the frontal region, among those tumors in which definite psychoses are present, 21 per cent. occur in the frontal lobes and only 10 per cent. in the cerebellum; or, in other words, 79 per cent. of all frontal lobe tumors are associated with psychical disturbances and 35 per cent. of cerebellar tumors. The temporal lobes also bear a close relation, as about 67 per cent. of all temporal lobe tumors have these symptoms. This predominance of frontal lobe tumors, where mental disturbances are prominent, is of interest in connection with one of our cases.

Some of the more definite mental symptoms are: 1. Epileptiform mania. 2. Melancholia and depression. 3. Confusion and hallucinations. 4. Mania. 5. Chronic paranoia. 6. Convulsions, either general or local (Jacksonian epilepsy), or both appear in 25 per cent. of all cases. Local convulsions are, of course, particularly frequent in lesions of the motor cortex, and in those cases would be a focal symptom rather than general.

6. *Constitutional disturbances*, anorexia, abnormally increased appetite, thirst, febrile movements, emaciation, disturbance of pulse (slow and irregular), and respiration are present in many cases.

7. *Focal symptoms* are said to be of two kinds: direct or destructive, those which are due to the destruction of tissue by the tumor itself, and indirect, or those caused by the pressure of the tumor upon the immediately surrounding structure of the brain.

The focal or localizing symptoms vary with the position of the tumor, and it is upon this that the diagnosis of the location of the new-growth is based. The diagnosis of the presence of a tumor is made on the presence of all or a part of the typical general symptoms as named above and such focal symptoms as may be present. These last, however, may be entirely absent.

The focal symptoms which are absolutely diagnostic are:

1. Paralysis or spasm—motor area, or possibly subcortical, affecting motor fibres (Spiller).[1]

2. Motor or sensory aphasia—Broca's area, or cortical centre of sight in occipital lobe, or of hearing in left temporal lobe.

3. Hemianopsia—occipital lobe or optic tract.

4. Cerebellar staggering (ataxia)—cerebellum.

Those which are helpful, but more or less doubtful, are:

1. Loss of sense of position and stereognosis—parietal region (Spiller).[2]

2. Definite mental changes (psychosis)—prefrontal area.

CASE I. *A round-celled sarcoma of right frontal region, apparently originating in wall of anterior horn of lateral ventricle.*—C. T., male, aged four and one-half years. In June, 1902, he had attacks of severe headache, appearing at irregular intervals, often several times a day. During such attacks he would scream and place his hands to his head. After the paroxysm of pain he would be drowsy and sleep for one or two hours. After a few weeks these symptoms disappeared, and he appeared to be quite well until December, 1902, when he had a short febrile attack which was called "la grippe." At about this time his headaches reappeared, and in addition he began to have attacks of vertigo, which were so severe that at times he would fall. He also began to vomit frequently, especially in the early morning before arising and before and after breakfast, the attacks seeming to have little relation to the taking of food. The vomiting, however, appeared to be preceded by some nausea, and the headaches were often apparently relieved by it. At this time he developed an almost insatiable appetite, and was never satisfied. All of these symptoms were increasing in severity. The writer was called February 4, 1903.

Examination. Appearance anæmic. No emaciation. Circumference of head, 21¼ inches. (A sister two years older measured 20½ inches.) The head looks large. No areas of tenderness on percussion. Headache in frontal region. Pulse irregular. Rate, 82. Marked difference in pulse rate during inspiration and expiration. Very perceptibly quickened during inspiration. (At times later, when he was feeling fairly well, the pulse was 95 and very regular in rate.) Tongue, when protruded, always deviates to the right, but can be moved to either side. Eyes: Fundus normal. No abnormalities found upon examination by Dr. Byington. Pupils have normal reaction.. Knee-jerks and other tendon reflexes normal. No ankle clonus. Skin very dry and somewhat scaly. Temperature normal.

As some gastric disorder was suspected by two consultants, a chemical examination of the vomitus was made, showing: Free

[1] THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, February, 1904.

[2] Ibid.

HCl, 0.072 gram per 100 c.c. Total acidity, 0.108 gram per 100 c.c.

On the morning of February 10th, at about 3 o'clock, the patient had a convulsive attack lasting about ten minutes. During the attack he was unconscious, and his hand was burned severely by a hot-water bottle. This convulsion was preceded by much tossing and muscular twitchings during the night. About an hour later he had another similar attack, but lighter, which began by spasmodic contractions of the motoroculi muscles (nystagmus). The pupils were widely dilated, and the eyes drawn strongly to the right and upward during the seizure. The body and limbs were rigid, and a few tonic contractions of the limbs were noted. This was followed by a period of drowsiness, and after a few days he seemed much better, but remained in bed.

He soon developed a great thirst, accompanied by marked polyuria. On February 22d a urinary test showed a quantity of 900 c.c. for six hours, with a specific gravity of 1003, and on February 26th 1500 c.c. for eight hours, with a specific gravity of 1002. He urinated very frequently. A blood test at this time showed the blood about normal, with leukocytes rather below than above normal (85 per cent.). During the time when thirst was so excessive his appetite was poor and he ate very little. In the two weeks following his first convulsive attacks he has had two or three of a similar nature.

March 3, 1903. In the last few days patient sleeps much, and is rather restless and stupid. He takes very little food or water. Feces and urine pass involuntarily. Now lies much on the back of his head, while before he would lie only on side or face. During the past month during my attendance very marked changes in mentality and disposition have been noticed, which are rapidly increasing in intensity. In place of a cheerful and pleasant disposition he has become irritable and cross, and shows a tendency to use vulgar language and to apply low epithets to members of the family, etc. Shows signs of mental deterioration and loss of memory. Repeats the same statement many times in an hour, and repeatedly calls for objects which have already been given him.

May 15th. Contractures and tetanic spasms of skeletal muscles, especially of the limbs, are gradually developing. There are no localized convulsions or contractures. The arms are completely and strongly extended, while the hands and fingers are flexed. The legs and feet are strongly extended. For the last few days his temperature has been observed to be abnormal, in the evening reaching 104°, in the morning subnormal, 96.5°.

25th. Patient is unable to see, and seems totally blind. His emaciation is extreme, having gradually progressed during the last three months.

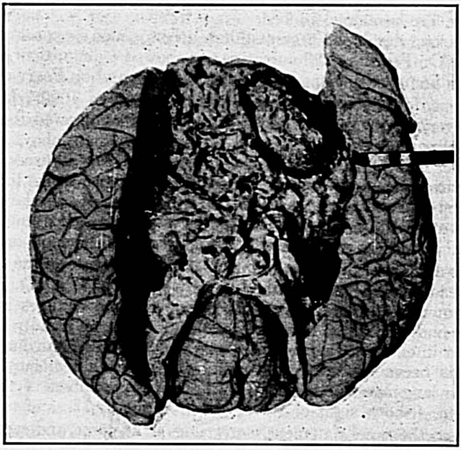
June 3d. Dr. Byington made ophthalmoscopic examination of eye-grounds, revealing choked disk in both eyes.

5th. While palpating scalp a marked swelling in the right frontal region was noted, soft, and about two by one and one-half inches in diameter and raised one-quarter inch above general surface of cranium.

During the past five weeks he has eaten practically nothing. The spasm of the limbs gradually became more marked. Death occurred June 9, 1903.

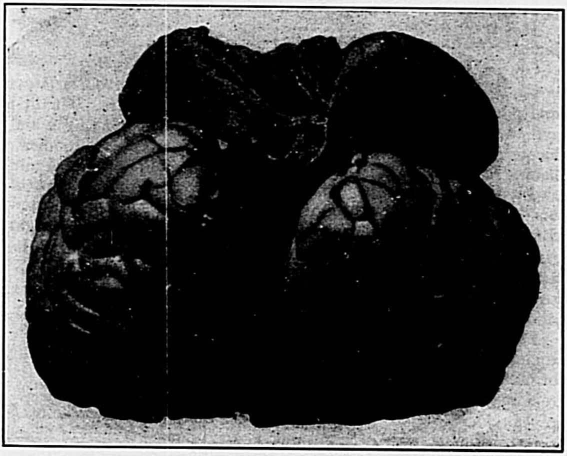
An *autopsy* was held five hours after death, only the cranium being opened. Head measured twenty-one inches in circumference after death. On removal of scalp the swelling mentioned in this history was found in the right frontal region. The periosteum was elevated one-fourth of an inch by a soft mass two by one and one-half inches. On removal of the periosteum it was seen to contain a pultaceous mass and puriform fluid, and the outer surface of the cranial bone was eroded and greatly roughened, but there was no visible connection with the cranial contents. The ventricles were greatly distended with a dark-colored puriform material containing numerous small masses of yellowish color, resembling the sand-like particles from an actinomycosis abscess. The brain substance was greatly thinned and the convolutions flattened. A soft yellowish granular mass was easily detached from the inner wall of the anterior horn of the right lateral ventricle, corresponding to

FIG. 1.



the area of the cortex over which the dura mater was inseparably adherent to the substance of the brain. (See Fig. 1.) This area was confined to the right frontal lobe, was two inches in diameter anteroposteriorly, and involved the first and second frontal convolutions, its posterior margin lying just at the fissure separating these from the ascending frontal convolution, also involving part of the prefrontal region. The dura mater at this area was quite firmly adherent to the frontal bone, but could be separated. The ventricular walls were softened and infiltrated with tumor cells. The optic nerves were degenerated.

FIG. 2.



CASE II. *Cyst of right cerebellar hemisphere.*—J. G., male, aged twenty-nine years. There is no history of any symptoms referable to intracranial tumor until six weeks before the death of the patient. At that time he had what was called a "bilious attack," with symptoms of nausea, vomiting, headache, and rise of temperature. Vertigo also rapidly developed.

Two weeks after the beginning of these symptoms they became so severe that he was confined to his bed, where he vomited very frequently, and loss of flesh was rapid. Two days before his death Dr. Riley was called in consultation, and found the following condition:

Dr. Riley's examination: Patient greatly emaciated, mind stuporous, face cyanotic, both pupils dilated, severe headache at back of head, vomiting at frequent intervals.

Dr. Byington was called on the same day, and made an ophthalmoscopic examination of the eye-grounds, finding a condition of choked disk and distinct retinitis. An ophthalmoscopic examination made a few days after the onset of his first symptoms showed no changes in the retina. At that time headache was present, and Dr. Byington noted a bewildered expression of the countenance.

Autopsy Report. The right cerebellar hemisphere contained a cystic cavity filled with a gelatinous fluid, three-fourths inch in vertical diameter by one inch in anteroposterior and lateral diameters. It was within the substance of the hemisphere and in close contact with the basilar surface. (Fig. 2.)

Microscopic Examination. Round-celled sarcoma, very vascular, surrounding the cavity containing a mucoid material.

Optic nerves degenerated.

CASE III. *Sarcoma of choroid plexus, corpora quadrigemina, and pineal gland.*—A. B., male, aged twenty-eight years. The first symptom present in this case was headache, which was severe and located on the right side of the head. These pains were periodical, lasting from 3 o'clock until noon on the days when present. From two months after the beginning of this symptom until the time of his death the patient was confined to his bed. His principal symptoms at this time were progressive weakness, anorexia, and slight rise of temperature. About six weeks before the time of death the patient was totally blind. There is no record of an ophthalmoscopic examination. Two weeks before death a complete aphasia developed. The entire course of his disease was about one year.

Post-mortem Examination. A distinct condition of internal hydrocephalus was present. The brain was removed and three ounces of clear fluid escaped from the floor of the third ventricle. In the region of the choroid plexus, the corpora quadrigemina, and the pineal gland, so that these structures were incorporated in the mass and indistinguishable, was a tumor in size about one inch in diameter and half an inch in thickness. (Fig. 3.)

Microscopic examination shows a very cellular tumor, composed of very large round cells with distinct vesicular nuclei, and among these a large number of very small, dark-staining, round cells, resembling a small round-celled infiltration. (Fig. 4.) The histogenesis of this tumor is somewhat obscure in my mind. It appears to me as very possible, and the change in the surrounding choroid reinforces this view, that the tumor cells have their origin from the ependyma cells of the choroid plexus.

CASE IV. *Glioma of right temporal lobe.*—Miss C., aged thirty-three years. This patient was first seen by the writer about one hour before death occurred, and previous to this time her symptoms had not been of such a nature as to bring her under the care of a

FIG. 3.

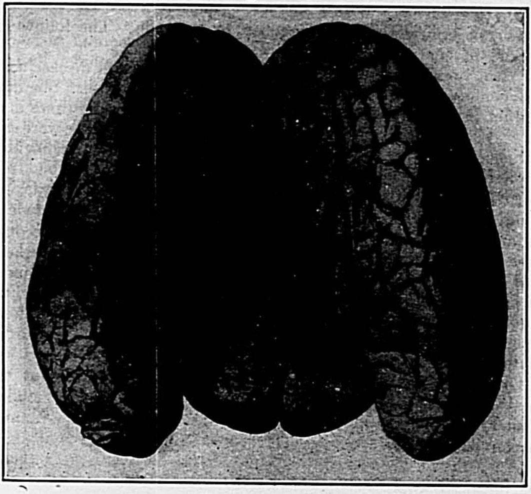
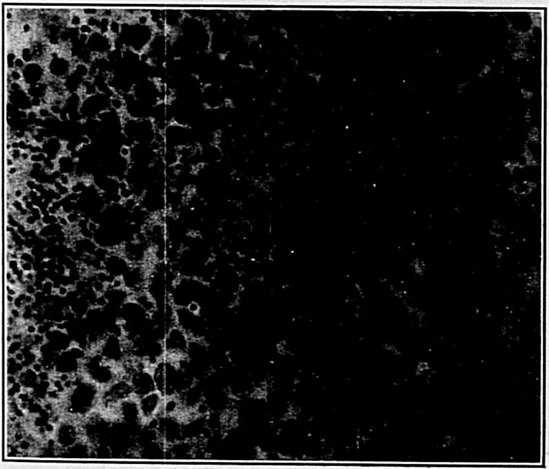


FIG. 4.



physician sufficiently for a diagnosis to be made. The following history of her illness, however, was obtained:

When twenty-one years of age patient had hip-joint disease and was confined to bed. The result was complete ankylosis. She has had for three years what were called sinking spells several times in a day. On two different occasions periods of unconsciousness were experienced. During this time she had noticed frequently a tendency to pitch forward while bending or leaning forward. She also had frequent attacks of very severe headache, the location of which was not mentioned. During these three years she had vomited only twice, so far as known, once about four weeks before death, and the second time only a few hours before her death. Somnolence was a marked and increasing symptom. She slept soundly at night and much during the daytime. Among her other symptoms she complained of constipation and cold feet. Upon examination five days before time of death pulse and temperature were normal, and she complained of severe pain in and around the right eye.

Dr. Byington made a partial examination of the eyes, but no mydriatic was used and no ophthalmoscopic examination was made. Vision was imperfect, and an appointment was made for an examination on the day after death occurred.

When the writer was called on the day of her death the patient lay unconscious, although it was stated that four hours before she was rational, and that a physician who had called had prescribed some simple treatment without suspecting any serious condition. Breathing was stertorous and of the Cheyne-Stokes type. The right pupil was widely dilated and the left contracted. The pupils, however, were variable, and at times for a few minutes seemed quite normal. The whole body was convulsed by muscular spasms, tonic and clonic. The right arm would be flexed and the left strongly extended, and in a few minutes the right extended and the left flexed. Similar changes were noted in the legs.

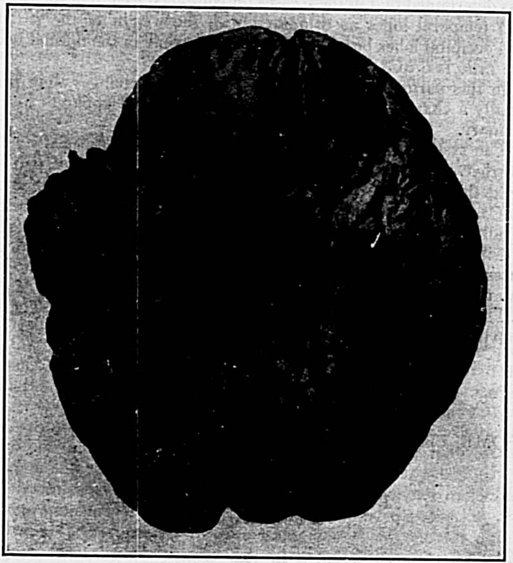
As death approached the breathing became slower and very irregular. The face was cyanotic. Breathing finally ceased at least five minutes before the heart action ceased. The patient apparently died of respiratory failure.

The autopsy revealed a large soft glioma of the lower surface of the right temporal lobe. At post-mortem the growth appeared pale rather than congested, and the microscopic examination revealed few bloodvessels in its structure, contrary to the usual description of such growths, There was no distinct line of demarcation between the tumor and the normal tissue. The growth in the temporal lobe had greatly displaced the cerebellum, as shown in Fig. 5.

Microscopic examination of a cross-section of the optic nerves showed a degeneration of a few fibres, but not all.

The symptomatology of these four cases, all of which were examined at autopsy, shows a striking similarity in the entire absence of all definite focal or localizing symptoms. In Case I. the body of the growth was confined to the right frontal lobe, lying just in front of but not directly affecting the motor cortex. If it had occupied a corresponding position in the left hemisphere no doubt a motor aphasia would have resulted, with agraphia if the patient had been old enough to write. The tumor in Case III. was located in the third ventricle, affecting the choroid plexus and adjacent structures.

FIG. 5.



The fact, as brought out by the patient's history, that he had been during his illness under the care of a number of physicians, including several neurologists, without a definite diagnosis, would indicate that his symptoms did not definitely point to the nature and location of the lesion. Case IV. is a third example of the same difficulty. The growth was at the base of the right temporal lobe, and there were absolutely no focal symptoms, and, indeed, a tumor was not suspected until just before death. It is possible that a similar lesion in the left temporal lobe might have resulted in worddeafness. However, in Case I. the location of the headache in the frontal region and the definite nature of the psychic symptoms present might direct one to the frontal lobe as the seat of the lesion. The idea that the frontal or prefrontal region is one of the principal centres of memory and reasoning has support from many sources, one of which was mentioned in the discussion of symptomatology above, where attention was directed to the greater frequency of definite psychic symptoms in tumors of the frontal lobe than in those occurring in any other portion of the brain. Mynert,[1] in his investigation of the brains of general paretics and senile dements, has determined that in these cases the combined weight of the frontal and temporal lobes as compared with the weight of the parietal and occipital lobes bears a ratio of 5 to 4, while in the normal brain the ratio is 6 to 3.

In this particular case (Case I.) the mental changes were principally a change in character and disposition and apparent loss of memory.

The systemic symptoms in the same case were especially noteworthy—abnormal appetite and anorexia at different periods, great thirst, and polyuria, rise of temperature, and irregular pulse. In Cases I., II., and IV. there was vomiting. Headache was present in all four cases, being the earliest symptom in each case, except possibly Case II., when the vomiting was present at first. In all the cases except Case III. there was distinct vertigo. In all except Case IV. there was distinct optic neuritis; in this case it was only slight. The psychic symptoms were prominent only in Case I. General convulsions were recorded in Cases I. and IV.

SOME PRACTICAL OBSERVATIONS ON SUPPURATIVE HEPATITIS.[2]

By William W. Ashhurst, M.D.,
of Chihuahua, Mexico.

An affection so frequent in this climate deserves our deepest study and most attentive observation, more especially because unfortunately the best-known works of medicine and surgery treat this subject, for the most part, in a rather superficial and ineffectual manner, a fact which is explained by the rarity of this disease in the more advanced centres of medical science and literature.

Although it is not my present purpose to discuss the etiology, I may observe in passing that in my own experience the abuse of

---

[1] Wien med. Presse, 1886, p. 413.

[2] Read before the Chihuahua Medical Society.